

Psychological Science

<http://pss.sagepub.com/>

Young Children Are Intrinsically Motivated to See Others Helped

Robert Hepach, Amrisha Vaish and Michael Tomasello

Psychological Science 2012 23: 967 originally published online 31 July 2012

DOI: 10.1177/0956797612440571

The online version of this article can be found at:

<http://pss.sagepub.com/content/23/9/967>

Published by:



<http://www.sagepublications.com>

On behalf of:



[Association for Psychological Science](http://www.sagepublications.com)

Additional services and information for *Psychological Science* can be found at:

Email Alerts: <http://pss.sagepub.com/cgi/alerts>

Subscriptions: <http://pss.sagepub.com/subscriptions>

Reprints: <http://www.sagepub.com/journalsReprints.nav>

Permissions: <http://www.sagepub.com/journalsPermissions.nav>

>> [Version of Record](#) - Sep 17, 2012

[OnlineFirst Version of Record](#) - Jul 31, 2012

[What is This?](#)

Young Children Are Intrinsically Motivated to See Others Helped

Robert Hepach, Amrisha Vaish, and Michael Tomasello

Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

Psychological Science
23(9) 967–972
© The Author(s) 2012
Reprints and permission:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/0956797612440571
http://pss.sagepub.com


Abstract

Young children help other people, but it is not clear why. In the current study, we found that 2-year-old children's sympathetic arousal, as measured by relative changes in pupil dilation, is similar when they themselves help a person and when they see that person being helped by a third party (and sympathetic arousal in both cases is different from that when the person is not being helped at all). These results demonstrate that the intrinsic motivation for young children's helping behavior does not require that they perform the behavior themselves and thus "get credit" for it, but rather requires only that the other person be helped. Thus, from an early age, humans seem to have genuine concern for the welfare of others.

Keywords

intrinsic motivation, children's helping behavior, pupil dilation, motivation, social behavior, social cognition

Received 8/1/11; Revision accepted 2/1/12

Soon after their first birthdays, human infants begin helping other people. Infants as young as 12 months of age point at an object to help an adult find it (Liszkowski, Carpenter, Striano, & Tomasello, 2006). By 18 months, infants show concern for and attempt to comfort individuals who are hurt (Eisenberg & Miller, 1987; Vaish, Carpenter, & Tomasello, 2009; Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992), and they help other people achieve their goals by fetching out-of-reach objects or removing obstacles for them (Warneken & Tomasello, 2006). Over the course of the 2nd year of life, children's helping behavior develops to include sharing even at some cost to themselves (Brownell, Svetlova, & Nichols, 2009; Svetlova, Nichols, & Brownell, 2010; see also Dunfield, O'Connell, Kuhlmeier, & Kelley, 2011; Warneken & Tomasello, 2009). Very young children thus demonstrate remarkable prosocial propensities, but it is not clear precisely what motivates them.

In one study, Warneken and Tomasello (2008) found that 20-month-old children who had previously received material rewards for helping were subsequently less likely to engage in further helping as compared with children who had received no such reward. This surprising finding suggests that infants' helping behavior is intrinsically motivated and is thus undermined by an extrinsic material reward (the *overjustification effect*; Lepper, Greene, & Nisbett, 1973). Although Warneken and Tomasello's study indicates that infants' motivation to help other people is intrinsic rather than driven by material rewards, nothing is currently known about the nature of this intrinsic motivation. It is possible, for example, that humans,

even as young children, help others because the receivers or observers of these acts give the helper credit and subsequently reciprocate (Nowak & Sigmund, 1998; Rockenbach & Milinski, 2006; Trivers, 1971). Thus, help may be motivated because providing help directly or indirectly benefits the helper. Note that for this interpretation to hold, the child must perform the helping act personally so as to gain the credit for him- or herself. An alternative possibility is that the helpful behavior is motivated by genuine concern for the person in need. Under this interpretation, it does not matter whether the child performs the helping act personally or simply sees another person perform it; what matters is that the person in need is helped.

The challenge is how to test which of these alternatives is correct. An assessment of children's outward behavior, which has thus far been the primary means for examining prosocial behavior, does not allow researchers to distinguish between distinct underlying motives. We thus addressed this question using a novel methodology to measure children's internal state during a helping task; specifically, we measured children's pupil dilation as an indicator of their level of sympathetic arousal (and its reduction).

Changes in pupil dilation reflect changes in the activity of the sympathetic nervous system (Loewenfeld, 1993; Lowenstein, Feinberg, & Loewenfeld, 1963; Wilhelm, 1991).

Corresponding Author:

Robert Hepach, Max Planck Institute for Evolutionary Anthropology,
Deutscher Platz 6, 04103 Leipzig, Germany
E-mail: hepach@eva.mpg.de

This system becomes aroused in situations, either positive or negative, requiring the organism's attention (e.g., Levenson, 2003). In humans, pupil dilation increases in anticipation of and following emotionally arousing events (Bradley, Miccoli, Escrig, & Lang, 2008; Nunnally, Knott, Duchnowski, & Parker, 1967; Partala & Surakka, 2003). Even infants younger than 1 year of age show increased pupil dilation in response to viewing representations of impossible physical events (Jackson & Sirois, 2009) or unusual social interactions (Gredebäck & Melinder, 2010).

We reasoned that the sight of someone in need of help might induce sympathetic arousal in young children, and we asked whether this arousal would be reduced only if children themselves provided help (i.e., could receive credit), or whether it would also be reduced if children could not themselves help but saw another individual help (i.e., they could not receive credit but simply saw the other person's need fulfilled).

Method

Participants

Participants were 2-year-old children (median age = 2 years 29 days, age span from youngest to oldest = 1 month 25 days). A total of 36 children (18 males, 18 females) participated in the study and were included in the final analyses. Additional children were tested but excluded from the final sample because of fussiness ($n = 8$) and either technical failure or experimenter or parent error ($n = 4$); also, 1 child could not be separated from her toy and hence did not have her hands free to help.

Materials

We used a "house" apparatus (2 m wide \times 2.15 m high \times 0.65 m deep) that had a window (68 \times 47 cm; 81 cm above the ground) through which participants could look inside once the curtain was opened (see Fig. 1). Below the window was a small slit with an external eye-tracking unit (Tobii model X120; Tobii Technology, Stockholm, Sweden; sampling frequency = 60 Hz) for measuring participants' pupil diameter. Participants' eyes were tracked while the stimuli were presented on a 24-in. computer screen (52 cm \times 32 cm) placed in the window. The vertical distance between the eye-tracking unit and the center of the computer screen was 38.5 cm.

The stimuli were shown at a monitor resolution of 1920 \times 1080 pixels in the following order: an attention-grabbing animation (4 s), a gray screen (3 s), and an action stimulus showing an adult performing either an introductory action (21 s; introductory trial) or one of two test actions (33 s each; test trials). In the introductory trial, the action stimulus showed the adult playing a game without needing help. In the test trials, one of the two actions portrayed him stacking cans to form a tower. After 28 s, the adult dropped the last can on the ground, pretending the drop was accidental. In the other test trial, the



Fig. 1. House apparatus. While infants viewed video stimuli on a monitor placed in the window, their eyes were tracked by an eye tracker through a slit below the window.

adult drew a picture with a crayon, which he dropped after 28 s. In both test trials, the adult was shown reaching for the object while expressing mild distress (5 s).

Immediately after each action stimulus, a still frame showing colorful bubbles on a colored background (5 s) and an animated version of that stimulus with music (10 s) were presented on the screen (neutral stimuli). These same neutral stimuli were presented a second time at the end of each trial as well, as described in the Procedure section. The color of the neutral stimuli was constant within a trial but varied across trials (red, blue, or purple).

All participants saw three instances of this stimulus sequence: one introductory trial and two test trials. The order of the color of the neutral stimuli and the order of the two test trials were counterbalanced.

Note that the prerecorded videos of the adult showed him acting inside the house. The actions were filmed such that the scene was shown as it truly appeared through the window; that is, the angles were adjusted to match the actual view. The appearance of the adult in the videos matched his appearance when he was seen in person.

Procedure

The procedure was adopted from a previous study showing that 2-year-olds will take a scene presented on a computer screen to resemble a real scene if they are made to believe that they are looking through a window (Troseth & DeLoache, 1998). The study that we present here took on average 45 min, including a warm-up phase followed by familiarization, switch, and test phases. In the familiarization phase, the children were presented with the house apparatus and could see its window, the curtain, and the inside of the house.

In the switch phase, the computer monitor, which had been hidden inside the house apparatus, was moved into the window for presenting the stimuli.

Calibration of participants' eyes was carried out before the beginning of the test phase, once children were seated on their parent's lap in front of the window and were looking at the computer monitor in it. Parents were instructed to shut their eyes during calibration. After the calibration, the stimuli were presented on the screen, using Tobii Studio (Version 2.2.4; Tobii Technology, Stockholm, Sweden).

The children were randomly assigned to one of three experimental conditions: the help condition, no-help condition, and third-person-help condition. The first trial of the test phase was always an introductory trial during which the adult in the video demonstrated putting a toy dolphin to bed. Participants' pupil diameter was measured during presentation of the neutral stimuli that followed this video (premeasurement). Although parents were allowed to watch the action stimuli, they were instructed to shut their eyes during the presentation of the neutral stimuli in order for the eye-tracking system to not erroneously track parents' eyes during the crucial measurement phases.

Next, parents carried their children away from the window and into the house. In the help condition, children were allowed to move around freely, whereas in the other two conditions, their parents held them back. While the children were inside the house, they saw the adult from the video sitting behind a table. After approximately 15 s (the time was kept equal for all participants), the children were carried back to the area in front of the window. They were placed so that they faced the window, the same neutral stimuli as before were presented, and participants' pupil diameter was measured again (postmeasurement).

Next, during the two test trials, children looked at the monitor in the house's window and watched the video of the adult reaching for the last can to finish stacking a tower and the video of the adult reaching for a crayon to finish drawing a picture (in counterbalanced order). Each video was followed by the neutral stimuli, during which participants' pupil diameter was measured (premeasurement). Parents then took their children inside the house and placed them on the floor approximately 2 m away from the adult, who was reaching for the object that had been shown in the video.

In the help condition, parents let go of their children and allowed them to retrieve the object and give it to the adult. Ten out of 12 children did so on both test trials. When the adult got the object in his hand, he looked at it, moved backward, and did not finish or continue the activity of stacking cans or drawing a picture. However, 2 children (1 boy and 1 girl) did not help on either trial. In those cases, after they had been exposed to the situation for 15 s, the adult stopped reaching, retreated his arm, and looked at the object. As soon as the children had placed the object in the adult's hand or 15 s had elapsed, their parents carried them back in front of the window. The same neutral stimuli as before were shown, and pupil diameter was measured (postmeasurement). Children who helped did so on average after approximately 6 s ($M = 5.72$ s, $SD = 2.25$ s) on the first trial and after approximately 4 s ($M = 4.25$ s, $SD = 0.98$ s) on the second trial.

In the no-help condition, children were carried to the same spot inside the house as in the help condition, but their parents held them back from helping the adult, and therefore the children did not get to help. The period of exposure was yoked to the average time children in the help condition had waited before helping the adult on each test trial. After approximately 6 s on the first test trial and approximately 4 s on the second test trial, the adult stopped reaching and returned to the same posture he did in the help condition when children did not help. Parents then carried their children back to the area in front of the window. The same neutral stimuli as before were shown, and pupil diameter was measured (postmeasurement).

The third-person-help condition was nearly identical to the no-help condition, with the only important difference being that a second experimenter picked up the object for the adult when children in the help condition would have picked it up, namely, after approximately 6 s on the first test trial and after approximately 4 s on the second test trial. When the adult got the object in his hand, he looked at it, moved backward, and did not finish or continue the activity of stacking cans or drawing a picture. Parents then carried their children back to the area in front of the window. The same neutral stimuli as before were shown, and pupil diameter was measured (postmeasurement).

For data analysis, we used only those measurements of participants' pupil diameter that were taken while participants watched the neutral stimuli just before and after they were exposed to the respective helping situations. We analyzed measurements from the first 10 s of those stimuli and computed the relative increase in pupil dilation (postmeasurement minus premeasurement, divided by premeasurement) for each subject per trial. As in other studies using pupil dilation as a dependent measure (e.g., Gredebäck & Melinder, 2010; Jackson & Sirois, 2009), the lighting conditions¹ were the same for all participants, and pupil data for both right eye and left eye were initially filtered, interpolated, and averaged (for details, see the Supplemental Material available online). The dependent variable was the difference in pupil diameter relative to the premeasurement diameter (i.e., change in pupil dilation); thus, a value of 1 would indicate that pupil diameter during the postmeasurement was twice pupil diameter during the premeasurement.

Results

A one-way analysis of variance was computed, with condition (help, no help, or third-person help) as a between-subjects factor.² This analysis revealed a significant effect of condition, $F(2, 33) = 5.28$, $p = .01$, adjusted $\eta^2 = .2$. Residuals did not differ significantly across conditions ($p = .48$). Results showed that the average relative increase in pupil dilation was significantly higher in the no-help condition ($M = 0.11$, $SD = 0.07$) than in either the help condition ($M = 0.04$, $SD = 0.07$), $t(22) = 2.47$, $p = .02$, or the third-person-help condition ($M = 0.04$, $SD = 0.05$), $t(22) = 3.08$, $p = .006$ (see Fig. 2). Increase in pupil dilation did not differ between the help condition and the third-person-help condition, $t(22) = 0.21$, $p = .83$.³

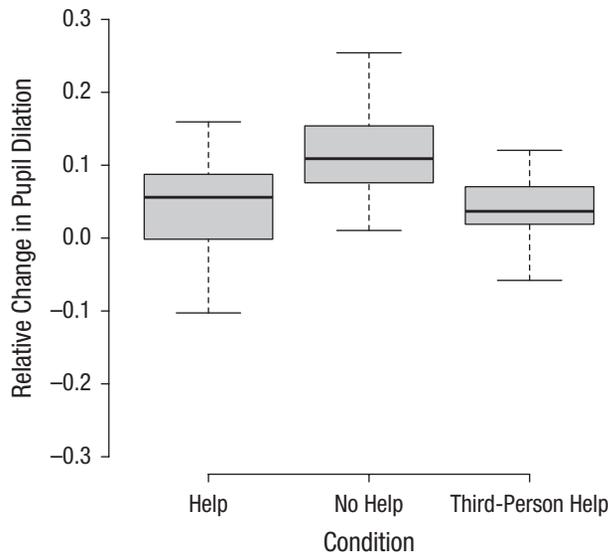


Fig. 2. Box-and-whisker plots of the mean relative change (from premeasurement to postmeasurement) in participants' pupil dilation as a function of condition (help, no help, third-person help). The boxes indicate the distribution of values lying between the first and fourth quartiles—essentially 50% of all values in a group. The solid lines inside the boxes represent the group medians. The dashed lines with the whiskers at their respective end points capture the location of extreme values, but do not capture outliers that exceeded the interquartile distance (from one end of the box to the other) by more than 1.5.

Separate analyses showed that the condition effect persisted when we controlled for time across the 10-s postmeasurement interval (for details, see the Supplemental Material). Because 2 participants in the help condition did not help on either test trial, we tested 2 additional participants who did help on both test trials. Analyses conducted after including these 2 new children did not change the overall results (see the Supplemental Material).

Figure 3 illustrates the time course of the relative change in pupil dilation across the 10-s postmeasurement interval in each condition. Children in the no-help condition clearly continued to show increased levels of sympathetic arousal following the live situation, whereas participants in the help and third-person-help conditions showed lowered arousal levels, presumably because the adult was helped.

Discussion

Previous studies of helping by humans—regardless of whether children or adults—have not specifically examined whether individuals were motivated to provide help themselves or simply to make sure that help was provided. In addition, previous studies on children's helping have relied on observations of external behavior only. In the current study, using a physiological measure, we found that the motivation for young

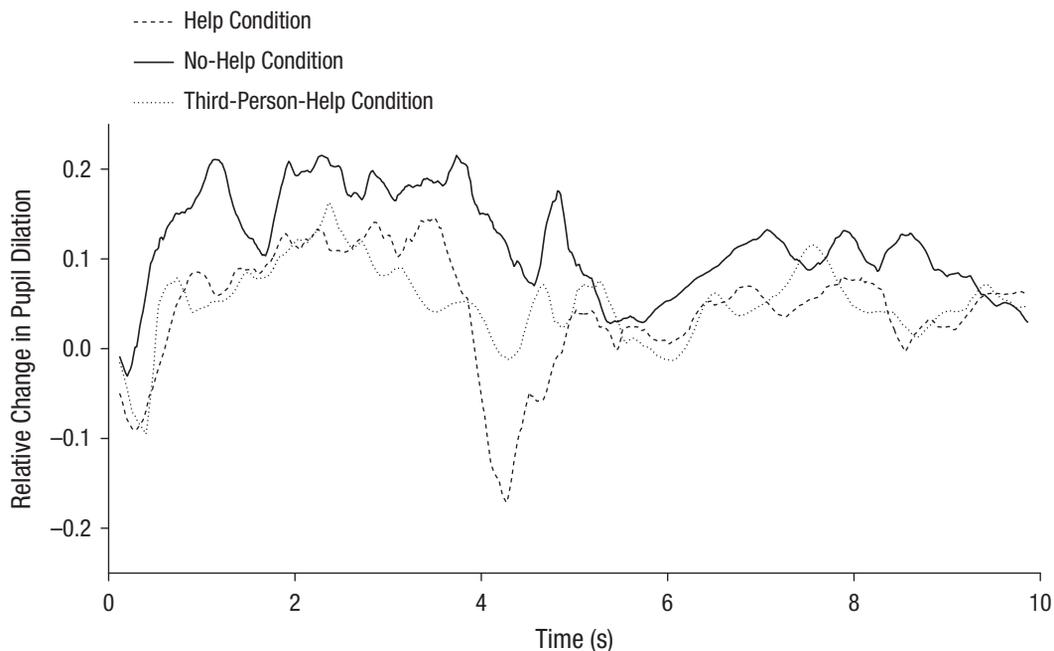


Fig. 3. Time course of the mean relative change (from premeasurement to postmeasurement) in participants' pupil dilation in the three conditions (help, no help, and third-person help). The values plotted represent the means across all subjects for each group across the 10-s interval for which the analyses were conducted. The number of values contributing to each mean varied with time because the moderate interpolation algorithm linearly approximated missing data only for time gaps not exceeding approximately 70 ms. This variation may explain sudden drops and increases in the graph. For illustration purposes, data were smoothed using a moving average filter.

children's helping behavior is simply that the person in need should be helped. Our findings demonstrate that young children do not provide help primarily for the sake of their own reputation, because if they did, they would have preferred to perform the helping act themselves (to get credit), and sympathetic arousal would have remained high in the third-person-help condition. Our results thus provide physiological support for the hypothesis that young children help other people because of genuine sympathy for their plight (e.g., Eisenberg & Miller, 1987; Vaish et al., 2009; Zahn-Waxler et al., 1992).

Although our application of the pupil-dilation measure is novel, its interpretation is not. As a well-established research measure (for a review, see Goldwater, 1972), it has recently been employed to study infants' responses to impossible or unusual situations (Gredebäck & Melinder, 2010; Jackson & Sirois, 2009). At the most basic level, changes in pupil dilation reflect changes in sympathetic activity (Loewenfeld, 1993; Lowenstein et al., 1963; Wilhelm, 1991), and our results can be interpreted as indicating higher levels of sympathetic arousal in children in the no-help condition than in children in either of the other two conditions after their return from their respective helping situations. Such changes in tonic pupil diameter over multiple seconds are more likely to reflect arousal state rather than phasic, rapid changes that occur in response to immediate task demands (Granholm & Steinhauer, 2004; for an example, see Kahneman & Beatty, 1966).

It is important to note that pupil dilation increases with experienced and perceived arousal rather than in response to positive or negative valence (Bradley et al., 2008; Partala & Surakka, 2003). Thus, differences between the no-help condition, on the one hand, and the help and third-person-help conditions, on the other, are most likely not a consequence of the possible negativity associated with viewing unresolved situations (as in the no-help condition) or the possible positivity associated with viewing resolved situations (as in the help and third-person-help conditions). All in all, then, the most plausible interpretation of our results is that young children are aroused when they see other people in need and are motivated to see them helped.

One alternative interpretation of our results could be that the children were intrinsically motivated not to see other people helped per se, but rather to see a causal sequence completed. According to such an account, the children in our study, and in fact in all previous studies on early instrumental helping (e.g., Warneken & Tomasello, 2006), may have viewed the situation not as a person needing help but rather as the person's goal-directed action being incomplete (for a discussion of children's responsiveness to different levels of other people's goal-directed behavior, see Tomasello, Carpenter, Call, Behne, & Moll, 2005). But other studies (e.g., Vaish et al., 2009) have shown that 18- and 25-month-olds are more likely to help people for whom they feel sympathetic concern than people for whom they do not. This finding is not consistent with a strictly causal interpretation, according to which children should want resolution of every incomplete causal

sequence equally, regardless of whether they have sympathy for the actor. In general, the methodology used in our study has the potential, we believe, to offer insights into this and similar issues by, for example, enabling the measurement of reductions in children's arousal as they view different situations of other people in need and different ways of resolving that need.

The children in our study wanted the other person to get help, regardless of whether they themselves provided it. This suggests that young children are not motivated primarily to get credit for their helpful acts. Once children have become more socialized into their specific social groups, as in kindergarten, they may be more likely to help and to cooperate in order to conform to the majority of the group or to established social norms that foster cooperation and sanction noncooperators (Gächter, Renner, & Sefton, 2008; Henrich et al., 2006). Therefore, children's concerns for self-reputation will gradually develop as they encounter new people and learn the social norms of their cultural group, especially during middle childhood. However, although concerns regarding self-reputation may mediate human cooperative behavior later in development, our findings suggest that they do not account for its emergence. Young children's early helping is motivated by a genuine concern for the welfare of the person in need.

Acknowledgments

We thank all the children and parents for participating in this study; Jana Jurkat for helping run the study; Malinda Carpenter and the Minerva Research Group on Social Origins of Cultural Cognition for providing the Tobii eye-tracking system; Anja Gampe for discussing the procedure; Tobias Grossmann for discussing the research; Roger Mundry for helping with R and statistics and for commenting on an earlier version of the article; Henrik Röthel for building the house apparatus; Ronny Barr for helping with preparing the stimuli; Sandra Lipke for helping record the stimuli; and Robert Schettler, Vladislava Nadova, Waldemar Beser, and Petra Jahn for providing hardware and software support.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Funding

This research was partially supported by a grant (Excellence Cluster 302: Languages of Emotions) from the Deutsche Forschungsgemeinschaft (DFG; German Research Foundation).

Supplemental Material

Additional supporting information may be found at <http://pss.sagepub.com/content/by/supplemental-data>

Notes

1. Detailed information about the procedure, the data analysis, and how luminance levels were controlled is provided in the Supplemental Material available online.

2. We averaged the values of the two test trials for each individual because there was no significant effect of test-trial order and no interaction between condition and test-trial order; for details, see the Supplemental Material.
3. All *t* tests were two tailed.

References

- Bradley, M. M., Miccoli, L., Escrig, M. A., & Lang, P. J. (2008). The pupil as a measure of emotional arousal and autonomic activation. *Psychophysiology*, *45*, 602–607.
- Brownell, C., Svetlova, M., & Nichols, S. (2009). To share or not to share: When do toddlers respond to another's needs? *Infancy*, *14*, 117–130.
- Dunfield, K. A., O'Connell, L., Kuhlmeier, V. A., & Kelley, E. A. (2011). Examining the diversity of prosocial behaviour: Helping, sharing, and comforting in infancy. *Infancy*, *16*, 227–247.
- Eisenberg, N., & Miller, P. A. (1987). The relation of empathy to prosocial and related behaviors. *Psychological Bulletin*, *101*, 91–119.
- Gächter, S., Renner, E., & Sefton, M. (2008). The long-run benefits of punishment. *Science*, *322*, 1510.
- Goldwater, B. C. (1972). Psychological significance of pupillary movements. *Psychological Bulletin*, *77*, 340–355.
- Granholm, E., & Steinhauser, S. R. (2004). Pupillometric measures of cognitive and emotional processes. *International Journal of Psychophysiology*, *52*, 1–6.
- Gredebäck, G., & Melinder, A. (2010). Infants' understanding of everyday social interactions: A dual process account. *Cognition*, *114*, 197–206.
- Henrich, J., McElreath, R., Barr, A., Ensminger, J., Barrett, C., Bolyanatz, A., . . . Ziker, J. (2006). Costly punishment across human societies. *Science*, *312*, 1767–1770.
- Jackson, I., & Sirois, S. (2009). Infant cognition: Going full factorial with pupil dilation. *Developmental Science*, *12*, 670–679.
- Kahneman, D., & Beatty, J. (1966). Pupil diameter and load on memory. *Science*, *154*, 1583–1585.
- Lepper, M. R., Greene, D., & Nisbett, R. E. (1973). Undermining children's intrinsic interest with extrinsic reward: A test of the "overjustification" hypothesis. *Journal of Personality and Social Psychology*, *28*, 129–137.
- Levenson, R. (2003). Blood, sweat, and fears: The autonomic architecture of emotion. *Annals of the New York Academy of Sciences*, *1000*, 348–366.
- Liszkowski, U., Carpenter, M., Striano, T., & Tomasello, M. (2006). Twelve- and 18-month-olds point to provide information for others. *Journal of Cognition and Development*, *7*(2), 173–187.
- Loewenfeld, I. E. (1993). *The pupil: Anatomy, physiology, and clinical applications*. Detroit, MI: Wayne State University Press.
- Lowenstein, O., Feinberg, R., & Loewenfeld, I. E. (1963). Pupillary movements during acute and chronic fatigue. *Investigative Ophthalmology & Visual Science*, *2*, 138–157.
- Nowak, M. A., & Sigmund, K. (1998). Evolution of indirect reciprocity. *Nature*, *393*, 573–577.
- Nunnally, J. C., Knott, P. D., Duchnowski, A., & Parker, R. (1967). Pupillary response as a general measure of activation. *Attention, Perception, & Psychophysics*, *2*, 149–155.
- Partala, T., & Surakka, V. (2003). Pupil size variation as an indication of affective processing. *International Journal of Human-Computer Studies*, *59*, 185–198.
- Rockenbach, B., & Milinski, M. (2006). The efficient interaction of indirect reciprocity and costly punishment. *Nature*, *444*, 718–723.
- Svetlova, M., Nichols, S. R., & Brownell, C. A. (2010). Toddlers' prosocial behavior: From instrumental to empathic to altruistic helping. *Child Development*, *81*, 1814–1827.
- Tomasello, M., Carpenter, M., Call, J., Behne, T., & Moll, H. (2005). Understanding and sharing intentions: The origins of cultural cognition. *Behavioral and Brain Sciences*, *28*, 675–735.
- Trivers, R. (1971). The evolution of reciprocal altruism. *Quarterly Review of Biology*, *46*, 35–57.
- Troseth, G. L., & DeLoache, J. S. (1998). The medium can obscure the message: Young children's understanding of video. *Child Development*, *69*, 950–965.
- Vaish, A., Carpenter, M., & Tomasello, M. (2009). Sympathy through affective perspective taking and its relation to prosocial behavior in toddlers. *Developmental Psychology*, *45*, 534–543.
- Warneken, F., & Tomasello, M. (2006). Altruistic helping in human infants and young chimpanzees. *Science*, *311*, 1301–1303.
- Warneken, F., & Tomasello, M. (2008). Extrinsic rewards undermine altruistic tendencies in 20-month-olds. *Developmental Psychology*, *44*, 1785–1788.
- Warneken, F., & Tomasello, M. (2009). Varieties of altruism in children and chimpanzees. *Trends in Cognitive Sciences*, *13*, 397–482.
- Wilhelm, H. (1991). *Pupillenreaktionen–Pupillenstörungen* [Pupillary reactions–pupillary disorders]. Stuttgart, Germany: Kohlhammer.
- Zahn-Waxler, C., Radke-Yarrow, M., Wagner, E., & Chapman, M. (1992). Development of concern for others. *Developmental Psychology*, *28*, 126–136.